

## **REMARKS**

Claims 1-9 are pending. By this Amendment, Figs. 4 is corrected, and the specification and claim 2 are amended.

Reconsideration based on the following remarks is respectfully requested.

### **I. The Drawings Satisfy All Formal Requirements**

The Office Action objects to the drawings based on informalities. Specifically, the Office Action asserts that “the wrap around each end processor” must be shown in the drawings or the feature canceled from the claims. This feature was canceled from claim 1 in the August 12, 2003 Amendment. Thus, there is not such requirement to show the feature in the drawings.

The Office Action also asserts that the feature of “wrapping around a first end processor, proceeding to and wrapping around a second end processor” must be shown in the drawings. This feature was illustrated by the proposed change to Fig. 4 presented in the August 12, 2003 Amendment, and is further clarified by the additional changes made to Fig. 4 by the present Amendment. Specifically, Fig. 4 shows two paths represented by respective dotted lines 490 and 492. The dotted line 490 shows an exemplary path of a packet when the packet is sent directly to a target processor, while the dotted line 492 shows an exemplary path of a packet when the packet is sent indirectly to a target processor. As clearly shown in Fig. 4, and as described in the specification at page 25, line 8 to page 26, line 5, when the packet is sent indirectly, the packet wraps around a first end processor, proceeds to a second end processor, wraps around the second end processor, and proceeds to the target processor.

In paragraph 29 of the Office Action, the Examiner suggests that the insertion of positive and negative axis in the figures was done to address the May 12 Office Action's request to show the direct and indirect paths in the drawings. However, this change to the drawings was done merely to address the Examiner's request to illustrate the positive and negative directions (see paragraph 6 of the May 12 Office Action). The illustrated positive and negative directions do not show the direct and indirect paths, but instead merely give a frame of reference. As discussed above, the dotted lines 490 and 492 show the direct and indirect paths, and also show "wrapping around a first end processor, proceeding to and wrapping around a second end processor", as recited in claim 4.

The Office Action also asserts that the z-axis must be shown in the drawings. This feature is canceled from claim 2.

The drawings satisfy all formal requirements, and thus withdrawal of the objection to the drawings is warranted.

## **II. The Specification Satisfies All Formal Requirements**

The Office Action asserts that a substitute specification filed August 15, 2003 has not been entered because a marked-up copy of the specification has not been supplied. A substitute specification was not filed on August 15, 2003 or at any other time during prosecution. Instead, amendments to the specification were made in the August 12 Amendment, which are re-presented in this Amendment with the changes shown.

## **III. The Claims Define Patentable Subject Matter**

The Office Action rejects claims 1-4 under 35 U.S.C. § 103(a) over Nugent (U.S. Patent No. 5,175,733) in view of Hayashi et al. (U.S. Patent No. 5,826,033) and Thorson (U.S. Patent No. 6,055,618); claim 5 under 35 U.S.C. § 103(a) over Nugent in view of

Hayashi and Thorson, and further in view of Ganmukhi et al. (U.S. Patent No. 6,449,667); claims 6-8 under 35 U.S.C. § 103(a) over Nugent in view of Hayashi and Thorson, and further in view of Ritter et al. (U.S. Patent No. 5,570,084); and claim 9 under 35 U.S.C. § 103(a) over Nugent in view of Hayashi and Thorson, further in view of Ritter, and further in view of Ganmukhi. These rejections are respectfully traversed.

Nugent, alone or in combination with the other applied references, does not disclose or even suggest a method for routing packets on a linear array of N processors connected in a nearest neighbor configuration, including, inter alia, determining whether a result of directly sending a packet from an initial processor to a target processor is less than or greater than  $N/2$ , and indirectly sending the packet so as to follow at least one of the wrapped paths, when the result is greater than  $N/2$  moves, as recited in claim 1.

Instead, Nugent discloses an adaptive routing means in which a plurality of processing nodes are connected in a multidimensional network A with a redundant network B. See column 3, lines 22-26 of Nugent. In order to relieve congestion in the X and Y direction within network A, a transition between the A and B networks can be made through a corresponding Z channel. See column 8, lines 2-14 of Nugent. The Office Action points out that, according to the method of Nugent, if the X displacement of a message is calculated to be greater than 0, then the message is routed in the +X direction. See column 14, lines 8-11 of Nugent. The Office Action appears to equate “indirect route” with a certain direction in the x-direction. However, simply sending the message in the +X direction or the -X direction is not equivalent to sending the message along an “indirect route”. The pending claims must be given their broadest reasonable interpretation consistent with the specification. In re Hyatt, 211 F.3d 1367, 1372, 54

USPQ2d 1664, 1667 (Fed. Cir. 2000). In the specification, “indirect route” is described as a route in which the packet is originally sent in the “wrong” direction, or in a direction away from the target node, so that the packet wraps around each end processor before arriving at the target processor. See, for example, page 18, lines 7-21, page 25, line 8 – page 26, line 5, and Fig. 4 of the present application. In contrast to the claimed invention, Nugent appears to calculate the most direct route for the message, even when the displacement is greater than 0. The only variable in Nugent is whether the message is routed in the positive direction or the negative direction. Nugent does not at all provide the option of sending a message along an indirect route.

Thorson does not make up for the deficiencies of Nugent. Thorson discloses a multiprocessing system including virtual channels and a virtual maintenance channel that allow for dead-lock free routing. See column 7, lines 17-63 and column 9, lines 11-19 of Thorson. The Office Action asserts that Fig. 4 of Thorson discloses, for each end processor of the array, connecting unused outputs to corresponding unused inputs. However, Fig. 4 merely shows a three-dimensional torus network in the x, y and z directions in which each processing node has communication links in both the + and – directions of the x, y and z dimensions. See column 6, lines 8-14 of Thorson. In the torus network, a ring is formed in each dimension where information can transfer from one node, through all of the nodes in the same dimension and back to the original node. See column 6, lines 18-21 of Thorson. Thus, the outputs of each node in the torus network of Thorson are input to another node, not connected to corresponding unused inputs, as in the claimed invention. Further, Thorson does not at all mention or even suggest sending a packet along an indirect route.

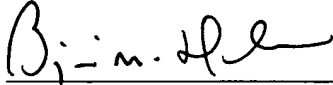
Neither Hayashi, Thorson, Ganmukhi nor Ritter make up for the deficiencies of Nugent. Thus, even combining these references with Nugent would not result in the claimed invention.

For at least these reasons, it is respectfully submitted that claim 1 is patentable over the applied references. Claims 2-9, which depend on claims 1, are also patentable over the applied references for at least the reasons discussed as well as for the additional features they recite. For example, none of the applied references disclose or even suggest the indirectly sending step including initially sending the packet in an opposing direction with respect to the target processor, wrapping around a first end processor, proceeding to and wrapping around a second end processor, and proceeding to the target processor, as recited in claim 4. As discussed, Nugent merely discloses a routing method in which, if the X displacement of a message is calculated to be greater than 0, then the message is routed in the +X direction.

Applicants respectfully request that the rejections under 35 U.S.C. § 103 be withdrawn.

Respectfully submitted,

Date: 1/7/04

  
Benjamin M. Halpern  
Reg. No. 46,494  
Attorney for Applicants

Mailing Address:  
F. Chau & Associates, LLP  
1900 Hempstead Turnpike, Suite 501  
East Meadow, NY 11554 U.S.A.  
(516) 357-0091  
(516) 357-0092 (FAX)